PhytoKeys 130: 49–57 (2019)
doi: 10.3897/phytokeys.130.34005
http://phytokeys.pensoft.net

RESEARCH ARTICLE

A peer-reviewed open-access journal
PhytoKeys
Launched to accelerate biodiversity research

Disporum nanchuanense (Colchicaceae), a new species from Chongqing, China

Xinxin Zhu[1,4], Shuai Liao[3], Sirong Yi[2]

1 *College of Life Sciences, Xinyang Normal University, Xinyang, Henan, 464000, China* **2** *Chongqing Three Gorges Medical College, Chongqing Engineering Research Center of Antitumor Natural Drugs, Wanzhou 404120, China* **3** *School of Life Sciences, East China Normal University, Shanghai 200241, China* **4** *Institute for Conservation and Utilization of Agro-bioresources in Dabie Mountains, Xinyang Normal University, Xinyang, 464000, China*

Corresponding author: *Sirong Yi* (yisirong123@aliyun.com)

Academic editor: *De-Zhu Li* | Received 20 February 2019 | Accepted 25 May 2019 | Published 29 August 2019

Citation: Zhu X, Liao S, Yi S (2019) *Disporum nanchuanense* (Colchicaceae), a new species from Chongqing, China. In: Cai J, Yu W-B, Zhang T, Li D-Z (Eds) Revealing of the plant diversity in China's biodiversity hotspots. PhytoKeys 130: 49–57. https://doi.org/10.3897/phytokeys.130.34005

Abstract

Disporum nanchuanense (Colchicaceae), a new species from Jinfo Mountain National Nature Reserve, Nanchuan District, Chongqing, China, is described and illustrated. It is similar to *D. longistylum* and *D. megalanthum*, but differs from the former in its stem branched type, tepals colour and size, stamens and pistil size; and it differs from the latter in inflorescence position, tepals shape, stamens position, pistil position and size. Meanwhile, the new taxon is assessed as Vulnerable (VU D2), according to the IUCN Red List criteria. Furthermore, an identification key to all Chinese species of *Disporum* is provided.

Keywords

Jinfo Mountain, Liliaceae, morphology, taxonomy

Introduction

Disporum Salisbury (1812) includes about 24 species distributed in Bhutan, China, India, Japan, Korea, Laos, Malaysia, Myanmar, Nepal, Russia, Sikkim, Thailand and Vietnam (Liang and Tamura 2000; Li et al. 2007; Hu et al. 2016; Zhu et al. 2016; Hareesh et al. 2018; WCSPF 2018). According to Liang and Tamura (2000), there

Copyright *Xinxin Zhu et al.* This is an open access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

are 14 species in China, including 8 endemic species. Recently, three new species were described by Li et al. (2007), Hu et al. (2016), and Zhu et al. (2016) from China.

During three field expeditions in Jinfo Mountain of Nanchuan District, Chongqing, an unknown species of *Disporum* was collected. After careful studies of the genus, particularly the flower characteristics of those species in the adjacent regions, as well as comparison amongst the unknown species and their related species, we conclude that it is a new species of *Disporum*, which has usually a simple stem, terminal inflorescence, large flower, white tepals with purple, apex obtuse and distinctly exserted stamens and style. A detailed description, along with line drawings, photographs, habitat, distribution and conservation status, as well as morphological comparison to similar species are also provided. Furthermore, a key to Chinese species of *Disporum* is provided.

Taxonomy

Disporum nanchuanense **X.X.Zhu & S.R.Yi, sp. nov.**
urn:lsid:ipni.org:names:60479342-2
Figures 1, 2, 3 and 4A-C

Type. CHINA. Chongqing: Nanchuan District, Jinfo Mountain National Nature Reserve, 29°02.67'N, 107°11.32'E, 1386 m a.s.l., 30 March 2018, *X.X.Zhu ZXX18025* (holotype: CSH [CSH 0151769!]; isotypes CSH!, KUN!).

Diagnosis. *Disporum nanchuanense* X.X.Zhu & S.R.Yi is similar to *D. longistylum* (Léveillé & Vaniot) Hara and *D. megalanthum* Wang & Tang, but it differs from *D. longistylum* in its stem which is usually simple, rarely branched, tepals white with purple, apex obtuse, 22–25 × 2.8–4 mm, filaments 20–24 mm long, anthers 5.2–5.6 mm long and ovary ca. 4.6 mm long, style 27–29 mm long; and it differs from *D. megalanthum* in its inflorescences terminal, petiole 3–13 mm long, tepals white with

Table 1. Morphological comparisons amongst *Disporum nanchuanense*, *D. longistylum* and *D. megalanthum*.

Characters	*D. nanchuanense*	*D. longistylum*	*D. megalanthum*
Stem	usually simple, rarely branched, 20–45 cm	usually branched distally, 30–100 cm	usually slightly branched distally, 30–60 cm
Inflorescence	terminal	terminal	opposite to a leaf or terminal on a short lateral branchlet
Petiole	3–13 mm long	3–10 mm long	2–4 mm long
Tepals	white with purple, oblanceolate, apex obtuse, 22–25 × 2.8–4 mm	green or greenish-yellow, spatulate-oblanceolate to obovate, apex subacute, 10–17 × 2–4(–8) mm	white, obovate-oblanceolate, apex acute, rarely obtuse, 20–38 × 5–8 mm
Stamens	distinctly exserted	distinctly exserted	included
Filaments	20–24 mm long	10–16 mm long	14–22 mm long
Anthers	5.2–5.6 mm long	2.5–4.5 mm long	4–6 mm long
Ovary	ca. 4.6 mm long	2–4 mm long	2–3 mm long
Style	27–29 mm long, distinctly exserted	8–17 mm long, exserted	12–18 mm long, included

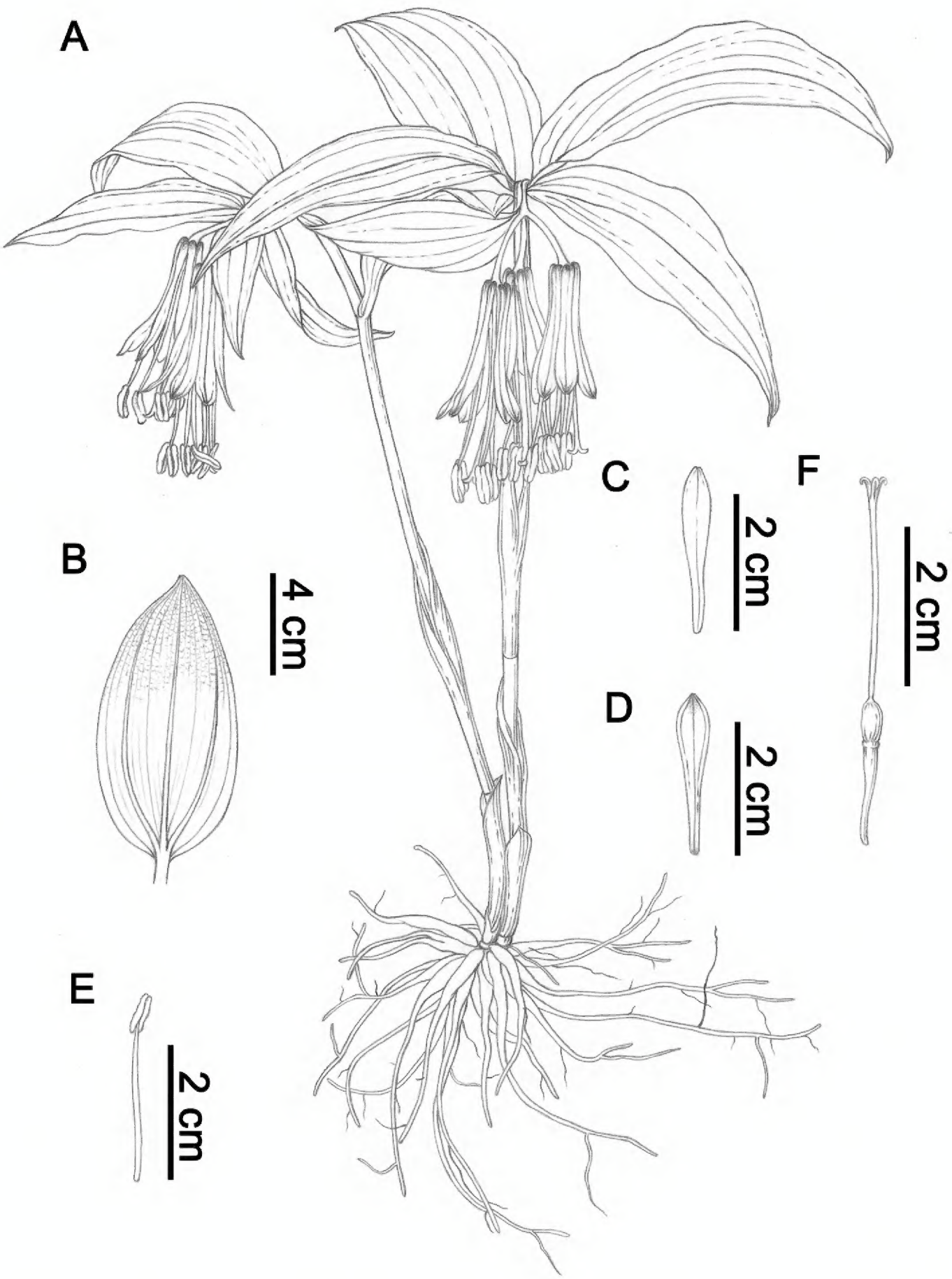

Figure 1. *Disporum nanchuanense* X.X.Zhu & S.R.Yi. **A** Plant **B** Leaf **C** Tepal in frontal view **D** Tepal in back view **E** Stamen **F** Pistil. Illustration by Huixia Dong.

purple, oblanceolate, apex obtuse, stamens distinctly exserted and ovary ca. 4.6 mm long, style 27–29 mm long, distinctly exserted. Detailed morphological comparison is shown in Table 1 and Figure 4.

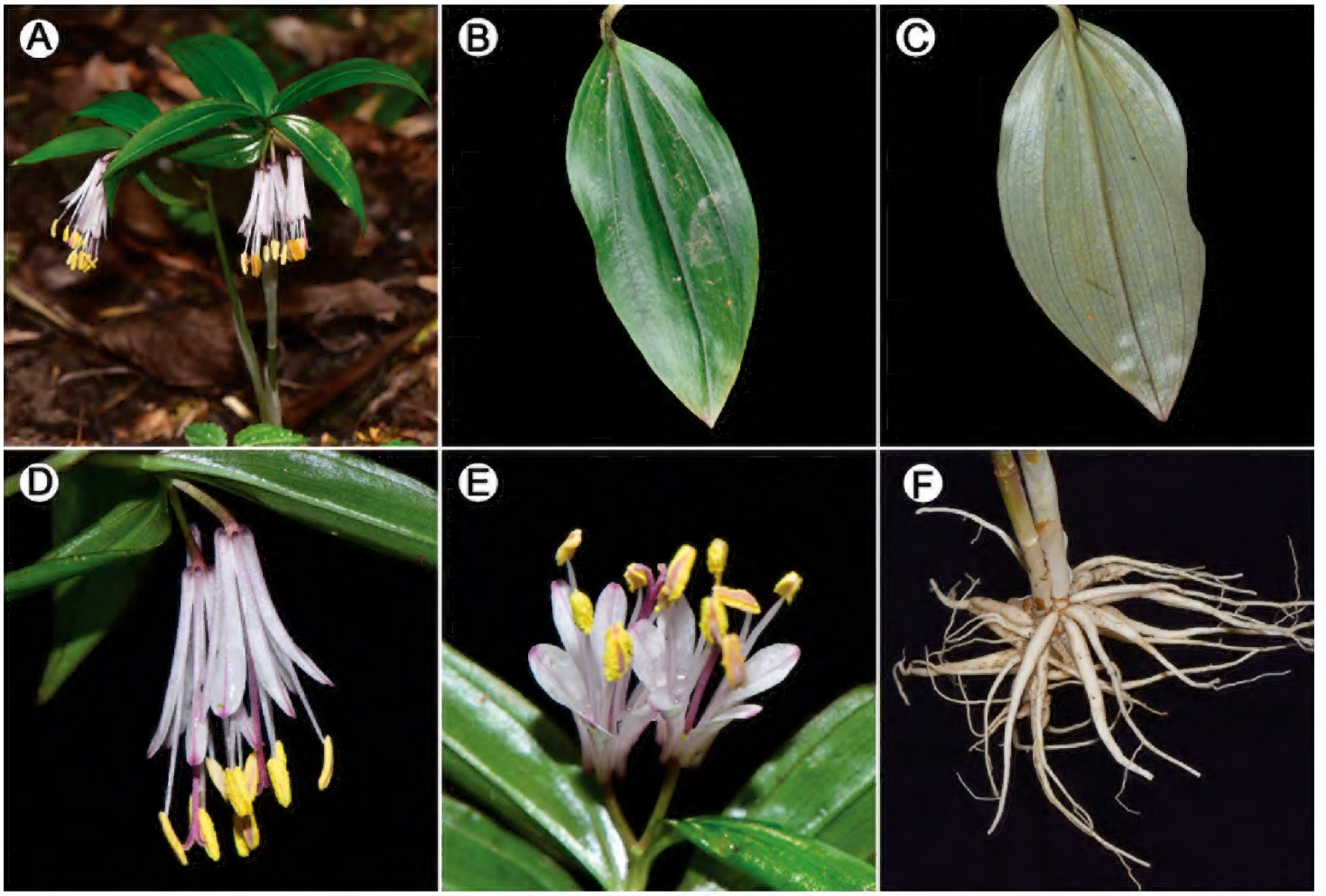

Figure 2. *Disporum nanchuanense* X.X.Zhu & S.R.Yi. **A** Plant **B–C** Leaves **D–E** Inflorescences **F** Roots. Photographed by Xinxin Zhu

Description. Perennial herb with short rhizomes; occasionally with stolons. Roots densely tufted, fleshy. Stem usually simple, rarely branched, 20–45 cm high, proximally with several sheaths. Leaves alternate, concentrated in distal part of stem; petiole 3–13 mm long; blade ovate-lanceolate to oblong, papery to thinly leathery, 6.5–12.5 × 1.1–6 cm, apex shortly acuminate to acute, base broadly cuneate or roundish, glabrous, 3–5-nerved. Inflorescence terminal, 2–7-flowered, non-pedunculate. Pedicels 10–13 mm long. Flowers narrowly campanulate, nodding; tepals 6, oblanceolate, white with purple, glabrous on both surfaces, minutely papillose on the lower margin, 22–25 × 2.8–4 mm, apex obtuse, base gibbous-spurred; spurs ca. 1.5 mm long. Stamens inserted at the base of tepals, distinctly exserted; filaments glabrous, 20–24 mm long, anthers 5.2–5.6 mm long. Ovary oblong, green, glabrous, ca. 4.6 mm long; style glabrous, 27–29 mm long, distinctly exserted, trifid at the apex, branches 3, densely papillose inside.

Phenology. Flowering from March to April. No fruiting specimens have been seen.

Etymology. The specific epithet refers to the type locality, Nanchuan District, Chongqing, China. The Chinese name is given as "南川万寿竹".

Distribution and habitat. *Disporum nanchuanense* is presently known only from the type locality in Jinfo Mountain National Nature Reserve, Nanchuan District, Chongqing. It grows under conifer-broadleaved forest at 1386–1411 m, together with *Arisaema bockii* Engl. (Araceae), *Cardamine hygrophila* T.Y.Cheo & R.C.Fang

Figure 3. Holotype of *Disporum nanchuanense* X.X.Zhu & S.R.Yi (CSH-0151769!).

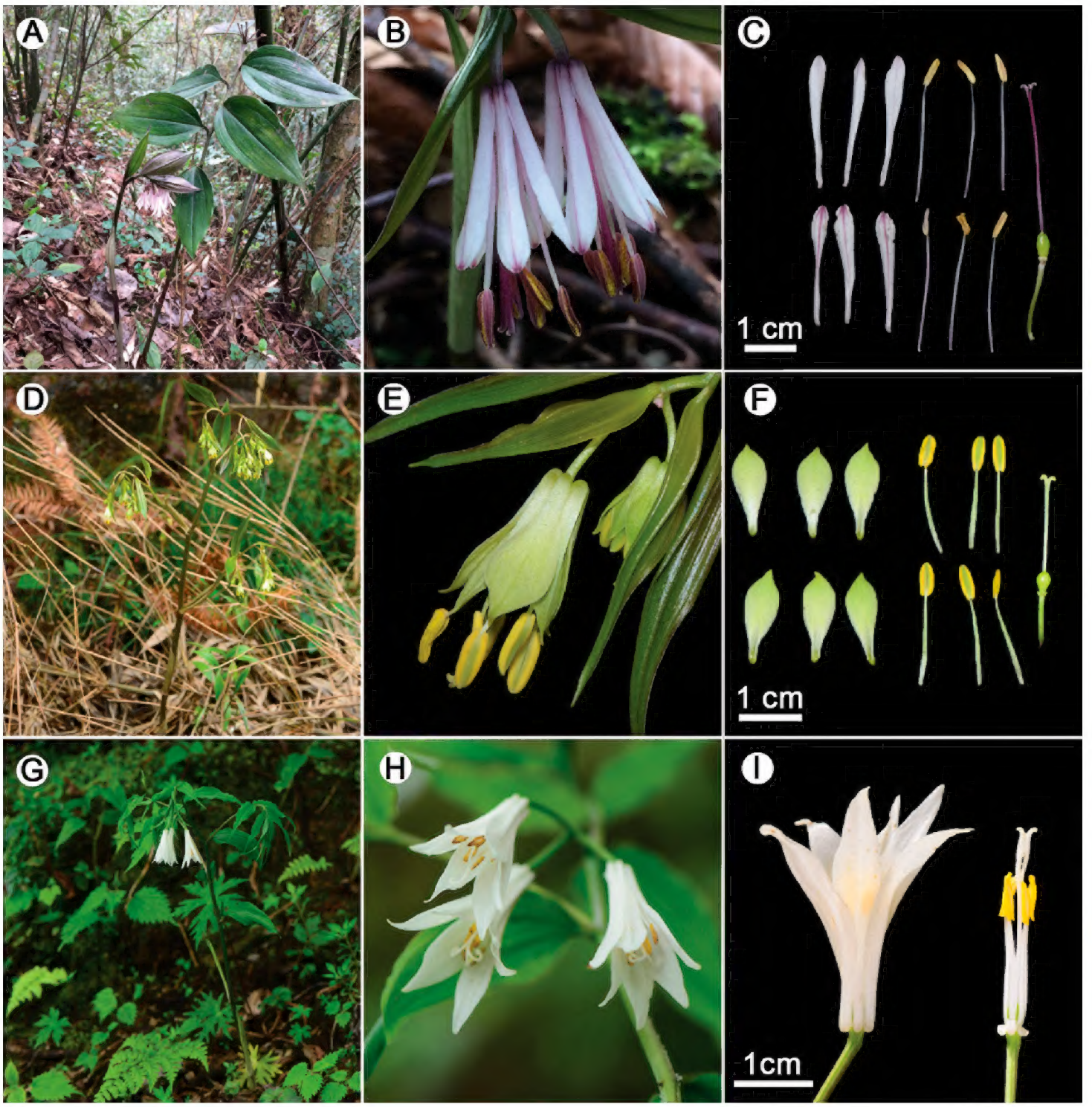

Figure 4. A-C: *Disporum nanchuanense* X.X.Zhu & S.R.Yi. **A** Plant **B** Inflorescence **C** Flower dissection **D-F:** *D. longistylum* (Lévl. & Vant.) Hara **D** Plant **E** Inflorescence **F** Flower dissection **G-I:** *D. megalanthum* Wang & Tang **G** Plant **H** Inflorescence **I** Flower dissection. **A-H:** Photographed by Xinxin Zhu; I: Photographed by Renbin Zhu.

(Brassicaceae), *Cephalotaxus fortunei* Hook. (Cephalotaxaceae), *Liriodendron chinense* (Hemsl.) Sargent. (Magnoliaceae), *Pinus massoniana* Lamb. (Pinaceae), *Rhododendron coeloneurum* Diels (Ericaceae), *Sanicula orthacantha* S.Moore (Apiaceae) etc.

IUCN Red List category. *Disporum nanchuanense* is known from only one population, with fewer than fifty individuals seen at this site. Therefore, the new species is assigned a preliminary status of Vulnerable (VU D2), according to IUCN Red List criteria, indicating a population with a very restricted area of occupancy (typically less than 20 km^2) or number of locations (typically five or fewer).

Specimens Examined (Paratypes). CHINA. Chongqing: Nanchuan District, Jinfo Mountain National Nature Reserve, 28 March 2017, *S.R.Yi ZXX17109* (CSH!, KUN!).

Key to the 18 species of *Disporum* in China

1 Tepals dark purple to purplish or yellow **2**
2 Tepals dark purple to purplish..... **3**
3 Tepals long spurred, spurs cylindric, 4–5(–8) mm..... ***D. calcaratum***
3' Tepals shortly spurred, spurs gibbous, 1–3 mm..... ***D. cantoniense***
2' Tepals yellow..... **4**
4 Leaf blade broadly elliptic to oblong-ovate; filaments minutely papillose proximally; Anhui, Chongqing, Hebei, Hubei, Jiangsu, Jiangxi, Liaoning, Shaanxi, Shandong, Sichuan, Zhejiang ..... ***D. uniflorum***
4' Leaf blade linear-lanceolate to oblong-lanceolate; filaments glabrous; Taiwan.... ..... ***D. shimadae***
1' Tepals white to cream, sometimes purple red distally **5**
5 Tepals minutely puberulent on both surfaces, apex long acuminate..... ..... ***D. acuminatissimum***
5' Tepals glabrous on both surfaces, apex obtuse to acuminate..... **6**
6 Flowers tubular-campanulate, not widely opening; tepals broadest in the upper part..... 7
7 Tepals smaller, 5–10 mm long..... ***D. hainanense***
7' Tepals larger, 10–38 mm long..... **8**
8 Leaves rather thick, subleathery, with distinct cross veins ..... ***D. trabeculatum***
8' Leaves thinner, herbaceous to thinly leathery, without distinct cross veins..... **9**
9 Stamens and pistil distinct exserted; tepals larger, 10–25 mm long..... **10**
10 Tepals white with purple, oblanceolate, apex obtuse, 22–25 mm long; filaments 20–24 mm long; style 27–29 mm long..... ***D. nanchuanense***
10' Tepals green or greenish-yellow, spatulate-oblanceolate to obovate, apex subacute, 10–17 mm long; filaments 10–16 mm long; style 8–17 mm long .... ***D. longistylum***
9' Stamens and pistil shorter than tepals **11**
11. Tepals larger, 20–38 mm long, white, apex acute, rarely obtuse; Chongqin, Guizhou, Hubei, Shaanxi, Sichuan ..... ***D. megalanthum***
11. Tepals smaller, 15–22 mm long, white with green tips and violet spots or cream with red spot at tips, apex blunt tip; Taiwan..... **12**
12 Plant deciduous, with stolon; inflorescences all truly terminal; tepals white with green tips and violet spots ..... ***D. nantouense***
12' Plant evergreen, without stolon; inflorescence pseudoterminal; tepals cream with red spot at tips ..... ***D. kawakamii***

6' Flowers obconic to turbinate, widely opening; tepals broadest in the lower or middle part **13**
13 Roots densely puberulent; tepals larger, 23–31 mm long..... **14**
14 Leaf blade narrowly lanceolate, thinly leathery; tepals white, oblong, broadest in the middle part, lower part not navicular-scaphoid ..... ***D. sinovietnamicum***
14' Leaf blade ovate to elliptic, papery or herbaceous; tepals greenish-yellow or white, lanceolate, broadest in the lower middle, lower part navicular-scaphoid . ..... ***D. xilingense***
13' Roots glabrous; tepals smaller, 10–18 mm long..... **15**
15 Stem often branched distally, 30–80 cm high, with 3–7 leaves below branching; tepals are 2–3 times as long as stamens; filaments as long as anthers..... ..... ***D. viridescens***
15' Stem simple or few-branched, 15–35 cm high, with 0–2 normal leaves below branching; tepals are 1.5–2 times as long as stamens; filaments are 2 times as long as anthers **16**
16 Leaves 4–9 all on the upper 2/3 to whole part of the stems; petioles less than 2 mm long; Shandong, Korean Peninsula, Japan..... ***D. smilacinum***
16' Leaves 3–4 all on the upper 1/3 part of the stems; petioles 2–4 mm long; Chongqing, Guizhou, Hunan, Sichuan, Yunnan **17**
17 Tepals greenish-yellow, (6)8–12 mm long; stamens (5)6–8 mm long; filaments 3–4.5 mm long..... ***D. bodinieri***
17' Tepals white, 13–17 mm long; stamens 8–11 mm long; filaments 5–7 mm long ..... ***D. jinfoshanense***

Discussion

Disporum nanchuanense is morphologically similar to *A. longistylum* and *A. megalanthum*. However, the new species differs from the two species in vegetative and reproductive characters, which have been summarised in Table 1, as well as those shown in Figure 4.

Though *Disporum* comprises only 24 species, the genus is still taxonomically problematic and many species are difficult to identify, with either diagnostic characters too variable and/or obscure or having been provided with incomplete descriptions due to a lack of sufficient field investigations (Hara 1984; Hara 1988; Hareesh et al. 2018). In an effort to achieve a better understanding of the taxonomy of *Disporum*, we have been working on the genus since 2016. Plants from 16 *Disporum* species from ca. 100 populations have been well observed and collected in the field during the past two years, especially for species from China. About 3800 specimens from 35 herbaria (AU, BM, BNU, CDBI, CIB, CSH, E, HENU, HHBG, HITBC, HTC, HX, IBK, IBSC, IFP, K, KUN, KYO, LBG, MO, NAS, NEFI, NKU, NWAFU, NY, P, PE, PEM, QTPMB, SCUM, SZ, TAI, TI, US and WUK; abbreviations follow Thiers in Index Herbariorum available at http://sweetgum.nybg.org/science/ih/) have been carefully checked. Here, a new identification key to 18 species of *Disporum* in China is provided based on our study and previous publications (Léveillé 1905; Hara 1988; Liang and Tamura

2000; Li et al. 2007; Hu et al. 2016; Zhu et al. 2016), in order to better evaluate of the position of the new species in *Disporum*.

Acknowledgements

The authors are very grateful to Huixia Dong for the line illustration. This study was partly supported by the National Natural Science Foundation of China (grant no. 31600161), granted by the Science & Technology Basic Resources Investigation Program of China-Survey and Germplasm Conservation of Plant Species with Extremely Small Populations in south-west China (2017FY100100) and Nanhu Scholars Program for Young Scholars of XYNU. Special thanks are given to Renbin Zhu (Xishuangbanna Tropical Botanical Garden, Chinese Academy of Sciences) for providing colour photos of *Disporum megalanthum*.

References

Hara H (1984) Comments on the East Asiatic plants (13). Shokubutsu Kenkyu Zasshi 59: 33–41.

Hara H (1988) A revision of the Asiatic species of the genus *Disporum* (Liliaceae). University Museum. University of Tokyo Bulletin 31: 163–209.

Hareesh VS, Floden A, Sabu M (2018) *Disporum mishmiensis* (Colchicaceae), a new species from North East India. Blumea 63(2): 121–124. https://doi.org/10.3767/blumea.2018.63.02.05

Hu RC, Xu WB, Huang YF (2016) *Disporum sinovietnamicum* sp. nov. (Colchicaceae) from south-western Guangxi, China. Nordic Journal of Botany 34(2): 152–155. https://doi.org/10.1111/njb.00989

Léveillé H (1905) Liliacées, Amaryllidacées, Iridacées et Hemodoracées de Chine. Memorie della Pontificia Accademia Romana dei Nuovi Lincei 23: 333–379.

Li XZ, Zhang DM, Hong DY (2007) *Disporum jinfoshanense* X. Z. Li, D. M. Zhang & D. Y. Hong, a new species of the Liliaceae from Chongqing, China. Zhiwu Fenlei Xuebao 45(04): 583–586. https://doi.org/10.1360/aps06079

Liang SJ, Tamura MN (2000) *Disporum*. In: Wu ZY, Raven PH (Eds) Flora of China, vol. 24. Science Press, Beijing & Missouri Botanical Garden Press, St. Louis, 246–269.

Salisbury RA (1812) On the cultivation of rare plants, especially such as have been introduced since the death of Mr. Philip Miller. Transactions of the Horticultural Society of London 1: 261–366.

Thiers B (continuously updated) Index Herbariorum: A global directory of public herbaria and associated staff. New York Botanical Garden's Virtual Herbarium. http://sweetgum.nybg.org/science/ih/ [accessed 1 August 2018]

WCSPF (2018) World checklist of selected plant families. Royal Botanic Gardens, Kew. Available from: http://apps.kew.org/wcsp/qsearch.do [accessed 10 September 2018]

Zhu XX, Zhang C, Shen B, Liu DT, Zhang L (2016) *Disporum xilingense* (Colchicaceae), a new species from Sichuan, China, and the exclusion of *D. leucanthum* from the Chinese flora. Phytotaxa 252: 063–068. https://doi.org/10.11646/phytotaxa.252.1.6